

# Bashing The Hanger 9 Cessna 182 ARF

## Part 1

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Pongo Air

This is a four part series covering a variety of modifications, which I incorporated in a Hanger 9 182 ARF. A total of nine modifications were made to the aircraft before it was flown. Four of the nine modifications incorporated are safety related. The areas requiring modification for safety purposes are:

- Firewall
- Wood engine mount
- Servo Tray
- Elevator and rudder push rods

Details on why each item is a safety risk is contained in the write up on that specific item.

### Part One

- Break away landing gear
- Upgrade the firewall

### Part Two

- Upgrade the engine mount
- Incorporate nose wheel brakes

### Part Three

- Incorporate landing lights
- Upgrading the servo tray

### Part Four

- Incorporating a Pull-Pull rudder control system
- Upgrading the Elevator control system
- A moving pilot head

### Main Landing Gear Modification

The Hanger 9 Cessna 182 ARF is supplied with pre-formed aluminum plate main gear. Utilizing landing gear of this type has many positive benefits however, there is a significant amount of damage that can occur to the fuselage and belly pan of the model should the gear be subjected to high side loading or shearing stress at the gear attachment point. Incorporation of breakaway mounting hardware will minimize airframe damage should the airframe be subjected to high side loading or shearing stress that would normal shear the main gear off the airframe.

Required materials:

Qty	Description
2	1/4 - 20 x 1" Nylon machine screws
2	1/4 - 20 T-Nuts (Optional)
1	Thin CA

### T-Nut Removal

The airframe has pre-installed metric T-nuts, which would be used as the main landing gear mounting points. Rather than chase down metric nylon hardware, I choose to remove the metric hardware and modify the airframe to accept SAE nylon hardware, which is readily available.

The T-nuts are located underneath the servo tray, which is shown in figure 1. To gain access to the T-nuts, remove the tray from the fuselage.



**Figure 1 Servo Mounting Tray**

On this airframe, the servo tray was held in place by a few drops of CA that had been put in each of the four corners. We cut through the CA bond using a hobby knife and extracted the servo tray by lifting it straight out. Retain the servo tray.

Extract the two T-nuts by threading one of the manufacture supplied metric machine screws into the T-nut from inside the airframe. The T-nuts will extract out of the mounting points by giving the metric machine screw a firm tug. Repeat this for the second T-nut installation. The T-nut hardware went directly to the trashcan.

### **Fuselage Modification**

The main landing gear supplied with the kit is predrilled for mounting using metric hardware. . Before resizing the gear mounting holes, verify the mounting holes align with the gear mounting holes in the belly pan. Using a 0.257-inch diameter drill bit (drill size F) resize the two mounting holes on the main landing gear. If you do not have a 0.257 diameter drill bit, it is possible to resize the mounting holes with a 0.25 inch diameter drill bit and a rat tail file, slightly enlarge the holes to provide clearance for the ¼-20 screws. Verify the mounting holes are correctly sized by test fitting a ¼-20 nylon machine screw. Debur both of the mounting holes.

Two options with this next step. One may incorporate a pair of SAE T-nuts into the airframe for the main gear attachment points or integrate the threads into the airframe wood. My description is for taping the airframe wood.

Tap the main landing gear mounting holes on the fuselage using a ¼-20 tap. Do not resize the holes to accept the tap; rather just cut the threads directly into the fuselage. Harden the mounting holes by lightly coat the threads with thin coat of CA and allow to dry. A CA accelerator would be a consideration. Once the CA is cured, tap the mounting holes a second time and test fit the ¼-20 nylon hardware.

### **Landing Gear Integration**

At this time, integrate the axels, tires and wheel pants onto the main gear. Mount the main gear using the 2 ¼-20 X 1 inch nylon machine screws.



**Figure 2 Main gear mounted**

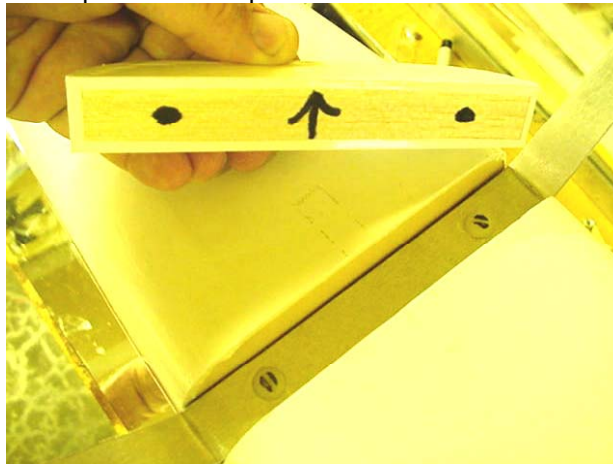


**Figure 3 Inside view of mounting points with 1/4-20 nylon hardware installed**

### **Landing Gear Cover**

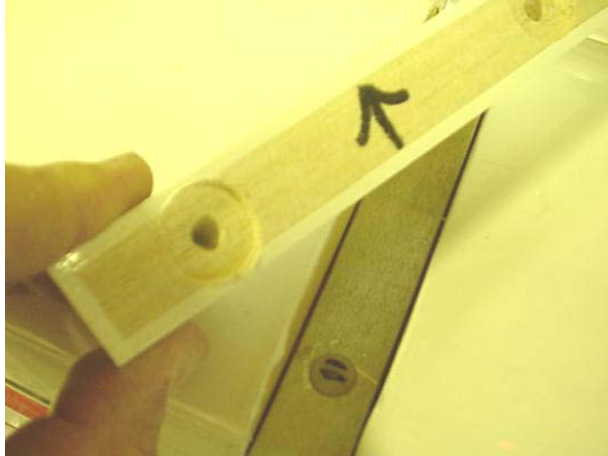
The main landing gear cover will not fit into place unless pair of clearance holes for the nylon hardware is incorporated into the gear cover. These holes may be incorporated through the following process.

Mark the nylon machine screw heads with an indelible marker. At the same time, mark the gear cover indicating which direction is forward. Position the gear cover in place. Apply a light pressure to the gear cover to transfer the indelible ink from the screw heads to the balsa wood. The markings will be the drill points to incorporate clearance holes.



**Figure 4 Gear cover with ink transfer**

Using a 1/2 inch flat drill bit, drill a pair of 1/2 inch diameter x 1/4 inch deep clearance holes on the inside of the gear cover.



**Figure 5 Main gear cover with clearance holes**

Test fit the gear cover. Depending on the nylon hardware selected, the depth of the clearance holes may have to be adjusted to obtain a good, flush fit.

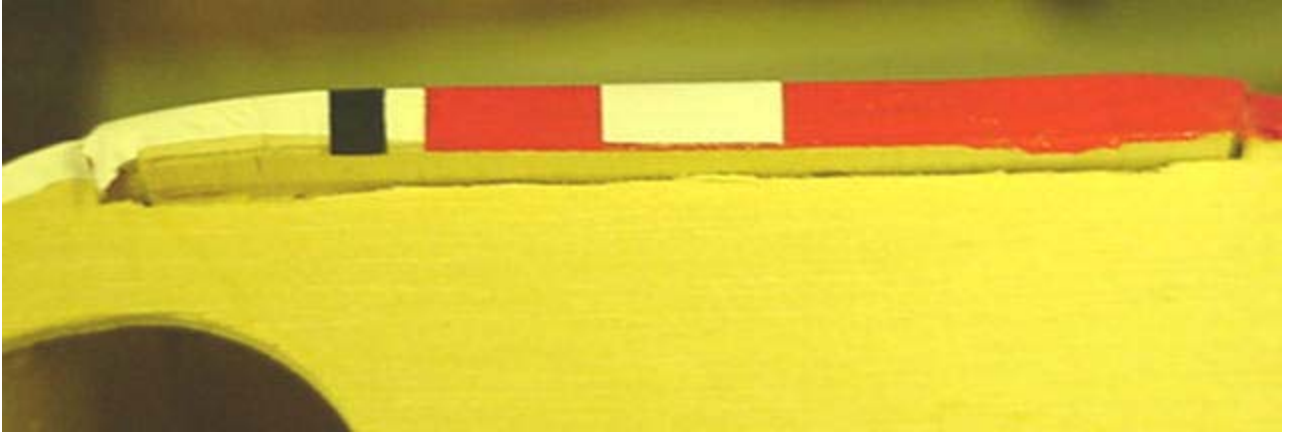


**Figure 6 Main gear cover with clearance holes**

Depending on how your engine is mounted, you may want to consider fuel proofing the gear cover hatch and gear mount area. The gear cover may be secured in place using 2 narrow strips of Carl Goldberg Ultracoat covering.

### **Firewall Upgrade**

The firewall in our aircraft was not glued in very well by the manufacturer. Gaps between the fuselage walls and firewall were so large that I could slide a metal machinists rule through the gap and not touch wood. The firewall also has a number of cut outs which potentially reduce the firewalls structural integrity. Failure of the firewall could result in an engine departing the aircraft in flight or a crash into the pit or spectator area. Rather than take a chance, we chose to incorporate a second firewall as a doubler.



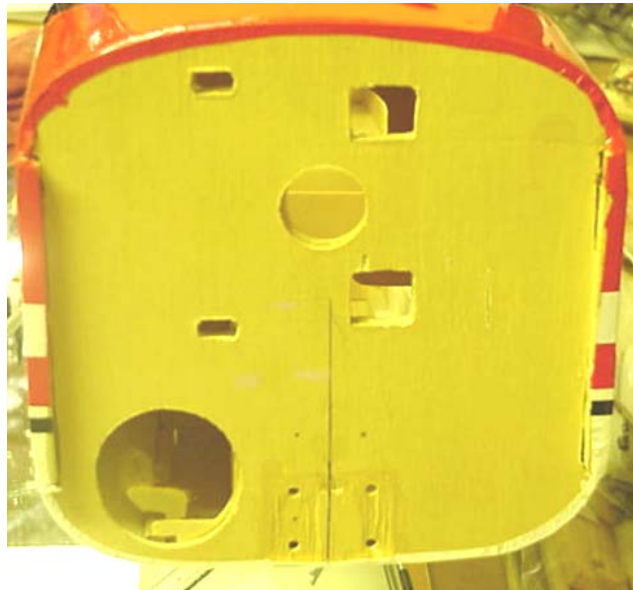
**Figure 7 Firewall gluing gaps**

Required materials:

Qty	Description
1	7" x 7" Hobby Plywood 1/8" thick
1	7" x 7" Cardboard 1/16" thick
1	30 minute epoxy kit

#### **Clean-up of the firewall**

The airframe has a pre-installed nose gear-mounting bracket. Completely remove this from the firewall. Save the nose gear bracket and discard the metric hardware. Lightly sand the firewall. Mark the engine mount and nose wheel bracket centerlines on the firewall.



**Figure 8 Firewall with centerlines**

### **Firewall template**

Manufacture a firewall template using the cardboard. Transfer the engine mount and nose wheel bracket centerlines to the template. Use the cardboard template as the pattern for the second firewall; mark the pattern and centerlines on the 7 x 7 hobby plywood blank. Cut the second firewall from the template. Test fit firewall to ensure the best possible fit.

### **Bonding of the firewall doubler**

Prior to gluing the firewall in place, lightly sand all bonding areas on the existing firewall as well as firewall doubler. Remove all sanding dust and materials from the firewall and doubler. Mix the batch of epoxy and apply a liberal coat of epoxy to the face of the existing firewall, ensuring that any marginal glue joints receive attention. Repeat this process with the firewall doubler.

Stand the fuselage on end, tail section towards the floor. Bond the firewall doubler to the original firewall. Compress the firewall doubler onto the firewall using 8-15 lbs of free weights. . Allow the firewall to cure for 24 hours.

Nose wheel bracket and engine mount installation will be covered in part 2.